PATENT
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In re Application of:

CHOEL-HEE HAN

Serial No.:	*to be assigned*	Examiner:	*to be assigned*
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For:	SYNCHRONIZING SATELLITE CLOCK IN BASE-STATION TRANSCEIVER		

INFORMATION DISCLOSURE STATEMENT

Mail Stop Patent Application
Commissioner for Patents
P.O.Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with 37 C.F.R. §1.56, and §§1.97 and 1.98 as amended, Applicant cites, describes and provides copies of the following art references:

1. U.S. Patent No. 6,243,372 to Petch *et al.*, entitled *METHODS AND APPARATUS FOR SYNCHRONIZATION IN A WIRELESS NETWORK*, issued on June 5, 2001;
2. U.S. Patent No. 6,452,541 to Zhao *et al.*, entitled *TIME SYNCHRONIZATION OF A SATELLITE POSITIONING SYSTEM ENABLED MOBILE RECEIVER AND BASE STATION*, issued on September 17, 2002;
3. U.S. Patent No. 6,377,517 to Tursich, entitled *METHOD AND SYSTEM FOR SYNCHRONIZING A TIME OF DAY CLOCK BASED ON A STELLITE SIGNAL AND A COMMUNICATION SIGNAL,* issued on April 23, 2002;
4. U.S. Patent No. 6,344,821 to Norimatsu, entitled *MOBILE COMMUNICATION SYSTEM AND INTER-BASES STATION SYNCHRONIZING METHOD*, issued on

February 5, 2002;

5. U.S. Patent No. 6,674,730 to Moerder, entitled *METHOD OF AND APPARATUS FOR TIME SYNCHRONIZATION IN A COMMUNICATION SYSTEM*, issued on January 6, 2004;
6. U.S. Patent No. 6,671,291 to Soliman, entitled *METHOD AND APPARATUS FOR SEQUENTIALLY SYNCHRONIZED NETWORK*, issued on December 30, 2003;
7. U.S. Patent No. 6,665,541 to Kransner *et al.*, entitled *METHODS AND APPARATUSES FOR USING MOBILE GPS RECEIVERS TO SYNCHRONIZE BASE STATIONS IN CELLULAR NETWORKS*, issued on December 16, 2003;
8. U.S. Patent No. 6,647,246 to Lu, entitled *APPARATUS AND METHOD OF SYNCHRONIZATION USING DELAY MEASUREMENTS*, issued on November 11, 2003;
9. U.S. Patent No. 6,628,628 to Yamazaki, entitled *WIRELESS COMMUNICATION HAVING OPERATION TIME CORRECTING FUNCTION*, issued on September 30, 2003;
10. U.S. Patent No. 6,621,813 to Petch *et al.*, entitled *METHODS AND APPARATUS FOR SYNCHRONIZATION IN A WIRELESS NETWORK*, issued on September 16, 2003;
11. U.S. Patent Application No. 2004/0047307 to Yoon *et al.*, entitled *APPARATUS AND METHOD OF FLYWHEEL TIME-OF-DAY (TOD) SYNCHRONIZATION*, published on March 11, 2004;
12. U.S. Patent Application No. 2004/0028162 to Skahan, entitled *MOBILE NETWORK TIME DISTRIBUTION*, published on February 12, 2004;
13. U.S. Patent Application No. 2003/0214936 to Goff, entitled *USING GPS SIGNALS TO SYNCHRONIZE STATIONARY MULTIPLE MASTER NETWORKS*, published on November 20, 2003;
14. U.S. Patent Application No. 2003/0139898 to Miler *et al.*, entitled *METHOD FOR SYNCHRONIZING OPERATION ACROSS DEVICES*, published on July 24, 2003;

15. U.S. Patent Application No. 2003/0109264 to Syrjarinne *et al.*, entitled *METHOD, APPARATUS AND SYSTEM FOR SYNCHRONIZING A CELLULAR COMMUNICATION SYSTEM TO GPS TIME*, published on June 12, 2003;
16. U.S. Patent Application No. 2003/0058742 to Pikula *et al.*, entitled *WIRELESS SYNCHRONOUS TIME SYSTEM*, published on March 27, 2003;
17. U.S. Patent Application No. 2002/0186716 to Eidson, entitled *SYNCHRONIZING CLOCKS ACROSS SUB-NETS*, published on December 12, 2002;
18. U.S. Patent Application No. 2002/0167934 to Carter *et al.*, entitled *METHOD AND SYSTEM FOR TIMEBASE SYNCHRONIZATION*, published on November 14, 2002; and
19. U.S. Patent Application No. 2002/0001299 to Petch *et al.*, entitled *METHODS AND APPARATUS FOR SYNCHRONIZATION IN A WIRELESS NETWORK*, published on January 3, 2002.

Petch et al. '372 relates to methods and apparatus for synchronization in a wireless network. As part of a preferred communication protocol, base stations which are synchronized to a PSTN of a wireless communication network, periodically transmits a preamble. A remote detects the preamble and, upon verification of the data contained in the base station transmission, sets its counter to an initialized state based on the received preamble. An early/late analysis of each subsequently received base station timing pulse is used to adjust both the mobile station timing and to adjust the output frequency of the mobile station master clock and codec clock to effectively maintain end to end synchronization with the respective base station and the PSTN throughout the duration of an established communication link.

Zhao et al. '541 relates to satellite positioning system enabled mobile receivers (310) and cellular communication network base stations (330) synchronized with satellite positioning system clocks and method therefore. In a network-assisted embodiment, a variable propagation delay for transmission of an assistance message (232) from the base station to the mobile receiver is

determined for correcting the handset clock (318). In others embodiments, local clock drift of mobile receivers (310) and/or base stations (330) are determined by a ratio of local and satellite time differences, based on sequential time snapshots, for use in correcting the local clocks.

Tursich '517 relates to a method for synchronizing a time of day clock of a clock system. A portable satellite timing system receives a satellite signal when at a first location and generates a time of day signal. The portable satellite timing system is then transported to a second location, where the satellite signal cannot be reliably received, and coupled to the clock system. The portable satellite timing system transfers the time of day signal to the clock system. Concurrently, the clock system receives a communication signal from a communication system and recovers a clock signal from a communication signal. The clock system synchronizes the time of day clock based on the time of day signal and the clock signal. The disclosed method advantageously synchronizes the time of day clock located in a structure without having to install a satellite antenna on the outside of the structure.

Norimatsu '821 relates to a plurality of base stations each of which calculates a distance function value with respect to a mobile station by detecting up signal therefrom in their own receiver (step S15), and transmits the calculated value to a base station controller (step S16). When a base station as reference base station receives, from the mobile station, the difference of timings of base station down signal reception (steps S17 and S18), it transmits the reception timing difference to the controller (step S19). The controller calculates, from data from an in-question base station, the difference of up signal reception timings in the reference and in-question base stations, and reports the difference to other base stations than the reference base station, thus causing down signal transmission timing updating.

Moerder '730 relates to time alignment of a signal from a remote unit at a hub station of a multiple access system, which is achieved based upon an initial time indication received from the hub station at the remote unit via a satellite. The remote unit transmits a signal to the satellite,

monitors for a retransmission of the signal from the satellite and measures the time difference between the outgoing and incoming signals. The remote unit, then, uses the time difference to more finely adjust the time alignment. Alternatively, the remote unit transmits a first signal advanced with respect to an on-time estimate to the hub station and receives a responsive energy indication from the hub station. The remote unit transmits a second signal delayed with respect to the on-time estimate to the hub station and receives a responsive energy indication from the hub station. The remote unit compares the two energy indications and adjusts the on-time estimate. In another embodiment, the remote unit receives a compensated time indication from the hub station. The remote unit compares the time indication with the time at which the indication was actually received based upon a local, accurate time reference. The remote unit sets a transmission timer equal to the current time indicated by the local reference advanced by the difference between the time indication and the time which the time indication was received.

Soliman '291 relates to a method and apparatus for sequentially synchronized timing and frequency generation in a communication network which includes a parent station for maintaining system time and frequency values, a time/frequency transfer unit for receiving and demodulating the system time and frequency values from the parent station and generating corrected system time and frequency values by adjusting a clock and the center frequency of a pilot signal at a child station to remove time and frequency discrepancies, and a child station to which the time/frequency transfer unit directly communicates the corrected system time and frequency values. The child station become a parent station upon communication of the corrected system time and frequency values. The sequence may be repeated for as many stations as are deployed in the network.

Krasner *et al.* '541 relates to methods and apparatuses for synchronizing basestations in a cellular network. One exemplary method performs time synchronization between at least two basestations, a first basestation and a second basestation, of a cellular communication system. In this exemplary method, a first time-of-day and a first geographical location of a first mobile cellular receiver station (MS) are determined from a first satellite positioning system (SPS) receiver which

is co-located with the first MS, and the first time-of-day and first location are transmitted by the first MS to a first basestation which determines a time-of-day of the first basestation from the first time-of-day and first location and from a known location of the first basestation. Also in this exemplary method, a second time-of-day and a second geographical location of a second MS are determined from a second SPS receiver which is co-located with the second MS, and the second time-of-day and the second location are transmitted to a second basestation which determines a time-of-day of the second basestation from the second time-of-day and the second location and a known location of the second basestation. Other methods and apparatuses are also described for synchronizing basestations in a cellular network.

Lu '246 pertains in general to a method of synchronizing remote stations in a communications system and, more particularly, to a method for measuring delay between two remote stations in a communications system. A method of measuring delay between a first station and a second station in different localities in a communications system that includes transmitting a first signal from the first station to the second station and simultaneously resetting a counting clock in the first station, receiving a delayed first signal at the second station, transmitting the delayed first signal to the first station, receiving a further delayed first signal at the first station and simultaneously stopping the counting clock, calculating the number of counts elapsed in the counting clock between the resetting and the stopping of the counting clock, wherein each count of the counting clock equals the period of the counting clock, and multiplying the number of counts with the period of the counting clock.

Yamazaki '628 relates to an integrated communication system which includes a CDMA network and other network such as a private cordless phone network which operates under a communication protocol different from that of the CDMA network. The CDMA network receives a GPS time signal from a GPS satellite and transmits a GPS-synchronization signal in synchronism with the GPS time signal. When a cellular phone receives an output request signal such as a position

registration request signal from the other network, it transmits an output signal such as a position registration signal to the other network at a time synchronized with the GPS-synchronization signal. The other communication network responsively corrects a time of synchronization of its operation time based on the received output signal.

Petch *et al.* '813 pertains to a method of synchronizing a base station and a remote station. The base station is communicatively coupled with the remote station and a reference network. The base station clock signal is compared with a reference clock signal derived from the reference network and adjusted accordingly. The adjusted base station clock signal is then used to generate timing information in the form of a preamble, which is periodically transmitted from the base station over a wireless communication network to the remote station where a clock signal is generated. The remote station compares the clock signal with the timing information and adjusts the clock signal accordingly. This is done without reference to an external clock.

Yoon '307 relates to a wireless communications network which includes multiple nodes, and a local node having GPS-based time for synchronization of time-of-day (TOD) in the network. The network includes at least the local node and a neighbor node communicating in the network. The local node includes a clock generator for generating a local TOD, and a time management unit, coupled to the clock generator, for adjusting the local TOD. A receiver in the local node receives from the neighbor node a message including a neighbor TOD. A counter in the local node computes and provides an integer value corresponding to a number of update values for synchronization of the neighbor TOD to the GPS-based time. A transmitter in the local node transmits to the neighbor node the integer value provided by the counter, whereby the time management unit adjusts the local TOD to the neighbor TOD and then transmits the

Skahan '162 relates to a method for synchronizing a time architecture of a mobile network that includes a plurality of network components, each having a time subsystem clock that is updated using a network time protocol (NTP) program. The method includes operating the components in

a hierarchical fashion and booting up all the network components such that execution of a NTP sub-program for making small incremental changes to the each component time subsystem clock is delayed. Additionally, the method includes iteratively executing a NTP sub-program for making large changes to each component time system clock until each component time sub-system clock establishes an initial synchronization with a parent component time sub-system clock. Furthermore, the method includes iteratively executing the NTP sub-program for making small incremental changes once initial synchronization is established such that each component time sub-system clock maintains synchronization with the parent component time sub-system clock.

Goff '936 relates to distributed computing systems. One embodiment of the invention provides a system that uses Global Positioning System (GPS) signals to synchronize multiple masters on a stationary network. During operation, the system receives the GPS signals at the multiple masters. Next, the system extracts a time value from the GPS signals at each master, and uses the extracted time value to synchronize a local clock at each master. The system subsequently uses the local clock at each master to synchronize interactions between masters.

Miller '898 relates to a method of synchronizing the actions of one or more devices using an RF time signal. In one embodiment, a clock in a device is synchronized to an RF time signal, and the clock is applied in a timed event performed by the device. The timed event may include determining a time of occurrence of an event associated with the device or starting a process performed by the device at a predetermined time. In an alternative embodiment, the method includes: coordinating a first timed event to be performed by a first device and a second timed event to be performed by a second device; receiving an RF time signal at the first and second devices; synchronizing a first clock in the first device and a second clock in the second device to a time indicated in the RF time signal; applying the first clock in the first timed event performed by the first device; and applying the second clock in the second timed event performed by the second device. The first and second events may be performed simultaneously or at different times. A global positioning system receiver within each device may be used to compensate for any propagation delay

of the RF time signal between the transmitter of the RF signal and the device.

Syrjarinne *et al.* '264 relates to a ranging receiver (10) which includes a cellular module (11), for providing time according to a positioning system to enable synchronizing a wireless system to the positioning system. The ranging receiver (10) includes both the cellular module (11) and a main module (12) that provides ranging receiver functionality. When the cellular module (11) receives a time-stamped frame from the wireless system, it sends a trigger signal over a special hardware path to the main module (12), which then relates the time of trigger receipt to time according to the positioning system by calculating a position-velocity-time (PVT) solution, using a local clock (18) to get the difference in time between receipt of the trigger and the instant to which the PVT solution applies, and then communicates to the cellular module (11) when it received the trigger, according to positioning system time.

Pikula *et al.* '742 relates to a wireless synchronous time system which comprises a primary master event device and secondary slave devices. The primary event device receives a global positioning systems "GPS" time signal, processes the GPS time signal, receives a programmed instruction, and broadcasts or transmits the processed time signal and the programmed instruction to the secondary slave devices. The secondary slave devices receive the processed time signal and the programmed instruction, select an identified programmed instruction, display the time, and execute an event associated with the programmed instruction. The primary event device and the secondary devices further include a power interrupt module for retaining the time and the programmed instruction in case of a power loss.

Eidson '716 relates to a distributed system with a time synchronization bridge for maintaining a relatively accurate common sense of time across sub-nets despite the use of a communication device such as a router which causes jitter in packet transfers across sub-nets. A distributed system according to the present teachings includes a set of nodes that communicate via a set of sub-nets. The nodes each have a local clock and mechanisms for maintaining time

synchronization among the local clocks by transferring timing data packets via the sub-nets. The timing data packets do not pass through a router. Instead, a time synchronization bridge obtains the timing data packets and in response coordinates time synchronization across the sub-nets.

Carter *et al.* '934 relates to a server-assisted approach for synchronizing timebases (120 and 140) in a client-server system utilizes global positioning system (GPS) receivers (136 and 110) at both the client and server. In a typical implementation, the GPS receiver (136) associated with the client system receives fragmentary or incomplete data from satellites that are part of the GPS. Thus, the client GPS receiver (136) is capable of receiving only fragmentary information and cannot derive accurate time signals therefrom. The server system (102) is associated with a GPS receiver (110) capable of generating accurate time and position data based on signals from GPS satellites (114). The fragmentary information from the client GPS receiver (136) is transmitted to the server (126) along with time information indicating the time at which the client captured the fragmentary GPS data. The server (126) analyzes the fragmentary GPS data with respect to the complete GPS data available from the GPS receiver (110) associated with the server. The server (126) accurately determines the actual time at which the fragmentary GPS data was captured and transmits timing signals to the client (146). The timing signals are used to correct the client timebase (140) thus synchronizing the client and server timebases (140 and 120).

Petch *et al.* '299 relates to a method of synchronizing a base station and a remote station. The base station is communicatively coupled with the remote station and a reference network. The base station clock signal is compared with a reference clock signal derived from the reference network and adjusted accordingly. The adjusted base station clock signal is then used to generate timing information in the form of a preamble, which is periodically transmitted from the base station over a wireless communication network to the remote station where a clock signal is generated. The remote station compares the clock signal.

The citation of the foregoing references is not intended to constitute an assertion that other or more relevant art does not exist. Accordingly, the Examiner is requested to make a wide-ranging and thorough search of the relevant art.

No fee is incurred by this Statement.

Respectfully submitted,

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INFORMATION DISCLOSURE STATEMENT PTO-1449 (PAGE 1 OF 2)	SERIAL NUMBER	DOCKET NO. P57042
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U.S. PATENT DOCUMENTS

EXAMINER	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE
	6,243,372	6/01	Petch et al.			
	6,452,541	9/02	Zhao et al.			
	6,377,517	4/02	Tursich			
	6,344,821	2/02	Norimatsu			
	6,674,730	1/04	Moerder			
	6,671,291	12/03	Soliman			
	6,665,541	12/03	Krasner et al.			
	6,647,246	11/03	Lu			
	6,628,628	9/03	Yamazaki			
	6,621,813	9/03	Petch et al.			
	2004/0047307	3/04	Yoon et al.			
	2004/0028162	2/04	Skahan Jr. et al.			
	2003/0214936	11/03	Goff			

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, etc.)*

EXAMINER: *DATE CONSIDERED:*

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INFORMATION DISCLOSURE STATEMENT PTO-1449 (PAGE 2 OF 2)	SERIAL NUMBER	DOCKET NO. P57042
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	2003/0139898	7/03	Miller et al.			
	2003/0109264	6/03	Syrjarinne et al.			
	2003/0058742	3/03	Pikula et al.			
	2002/0186716	12/02	Eidson			
	2002/0167934	11/02	Carter et al.			
	2002/0001299	1/02	Petch et al.			

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